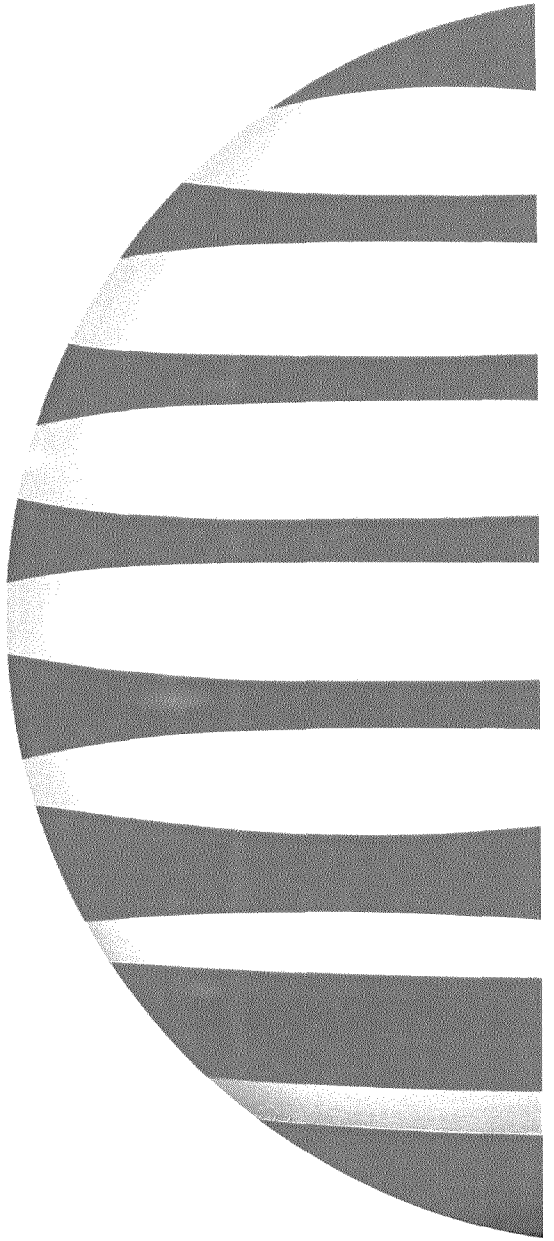
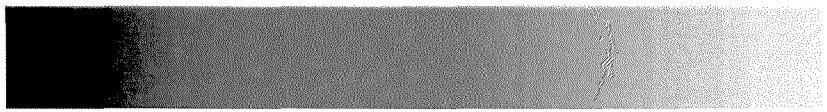
Services over IP Network Evolution

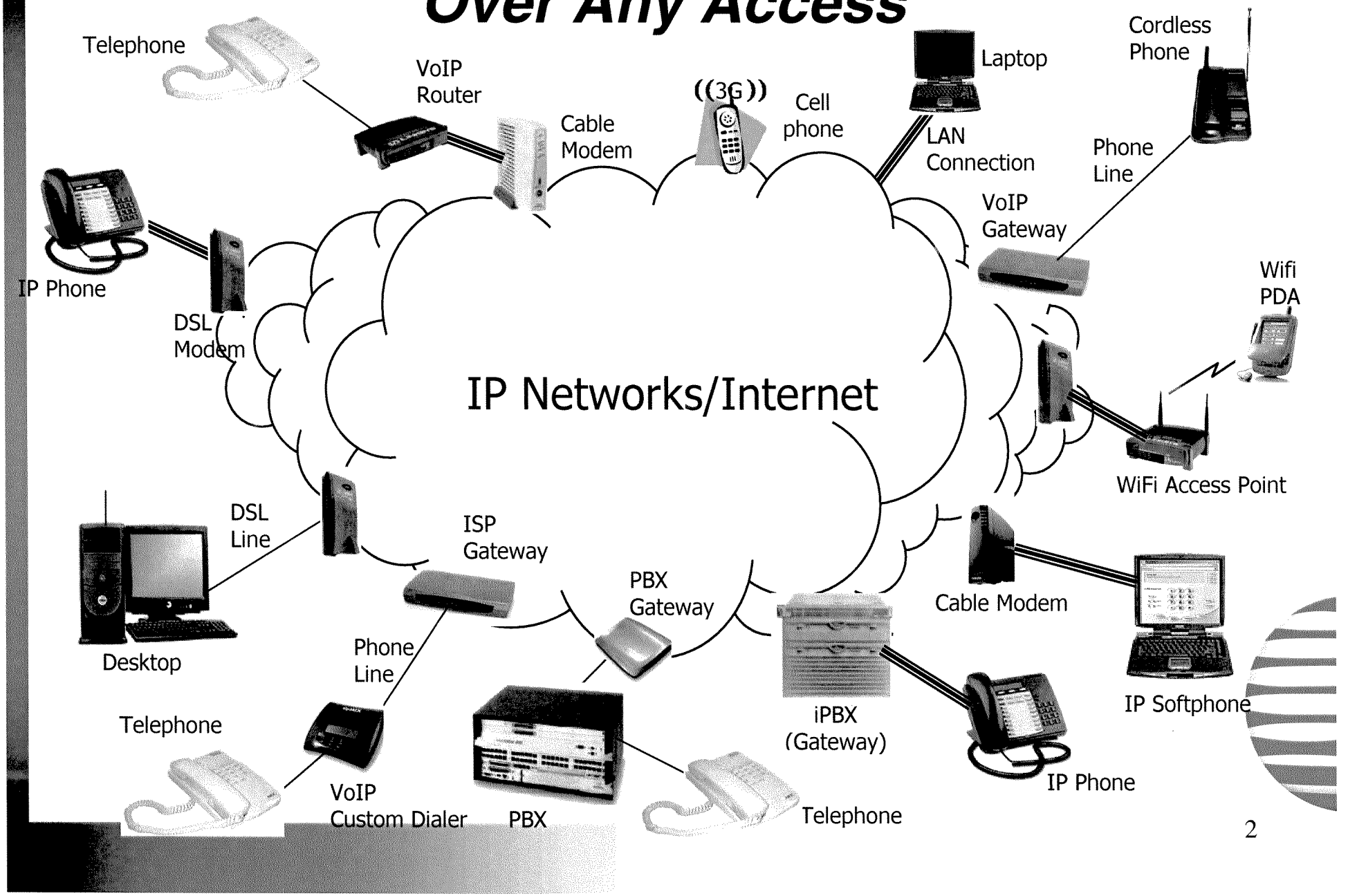


Hossein Eslambolchi

AT&T CTO & CIO and
President - AT&T Labs



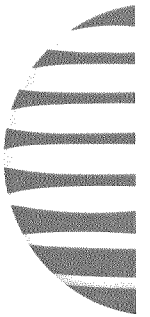
Power of IP: Any Device to Any Device Over Any Access



Some Industry Trends

- **Data / voice distinction is blurring**
  - The Internet is increasingly being used for voice and data, including AT&T's phone-to-phone IP telephony
  - Many corporate packet networks run VoIP and TDM combinations
  - LD and Local providers run VoIP for an increasing portion of total traffic
  - Cable operators are offering VoIP and cable telephony services
- **Voice is becoming an application over IP networks**
  - The industry architecture for VoIP is to treat the voice packets and the signaling as applications on an IP network
  - Innovative IP-based applications (call routing, integrated messaging, …) are written for the IP network
  - Phone numbers are going to be location independent
  - Phone calls are going to be distance independent
- **Device functionality is converging**
  - Emergence of devices such as cell phones that are PDAs, SIP telephones that are also Java computing devices, WiFi handsets that are SIP endpoints
  - Protocol conversion is happening directly in many CPE devices, not just "computers"

It is quickly becoming difficult to discern what a "phone call" is in the traditional sense

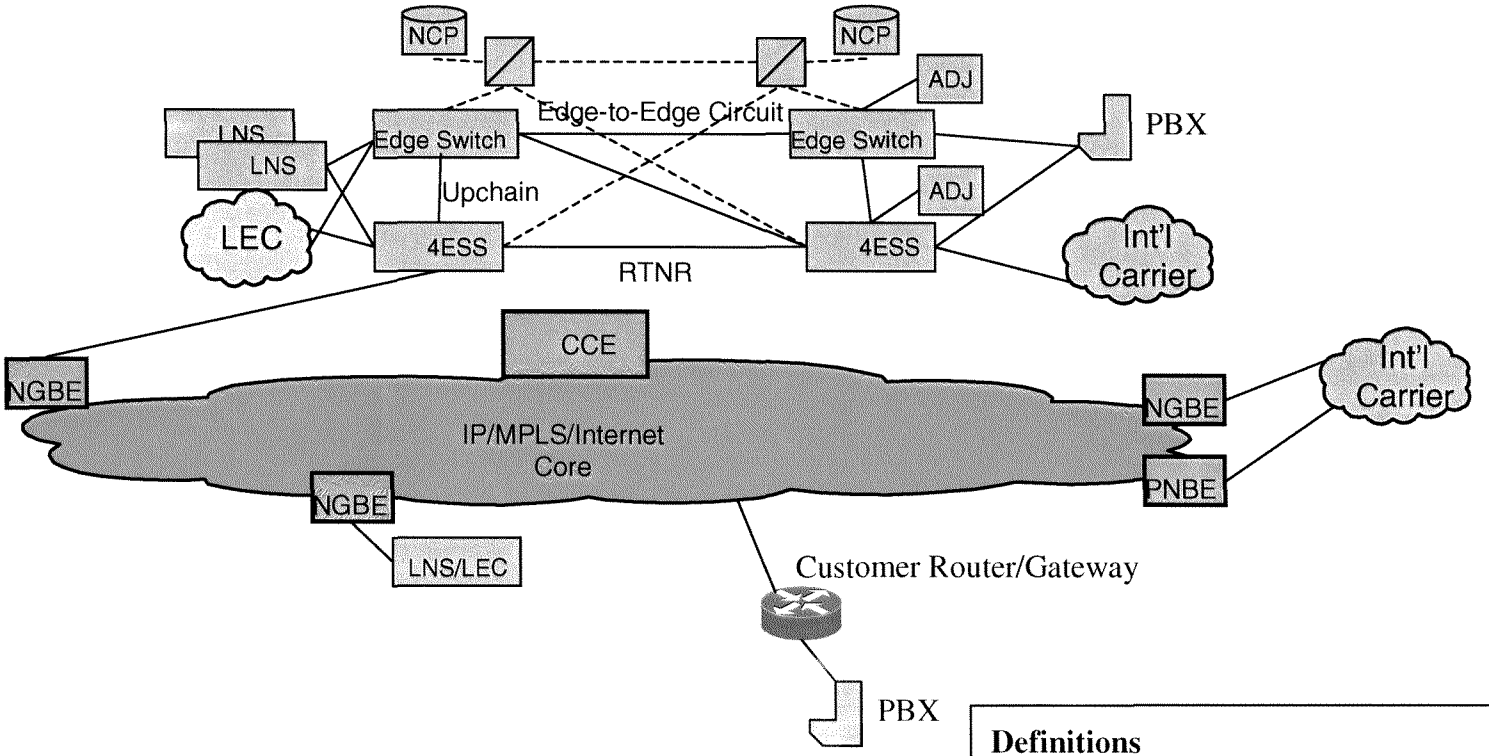


AT&T's Approach to VoIP

- **Voice over IP – The early days**
  - Learnings to improve reliability, operations and scalability
  - Network efficiency and availability of cost-based termination
  - Integrated access types
- **Voice over IP – Today's build-out**
  - Infrastructure capital savings
  - Executing the build-out with equipment and systems on par with carrier-quality
  - Reach to native IP endpoints (cable, DSL, private line, VPN, IP-PBXs)
- **Services over IP – The Target: seeds planted for the industry's future**
  - Value-added services based on direct IP connections to the network
  - A software-based platform for innovative third-party applications, devices and access types

AT&T is on a migration path to provide value-added services on a reduced cost infrastructure

VoIP – The Early Days

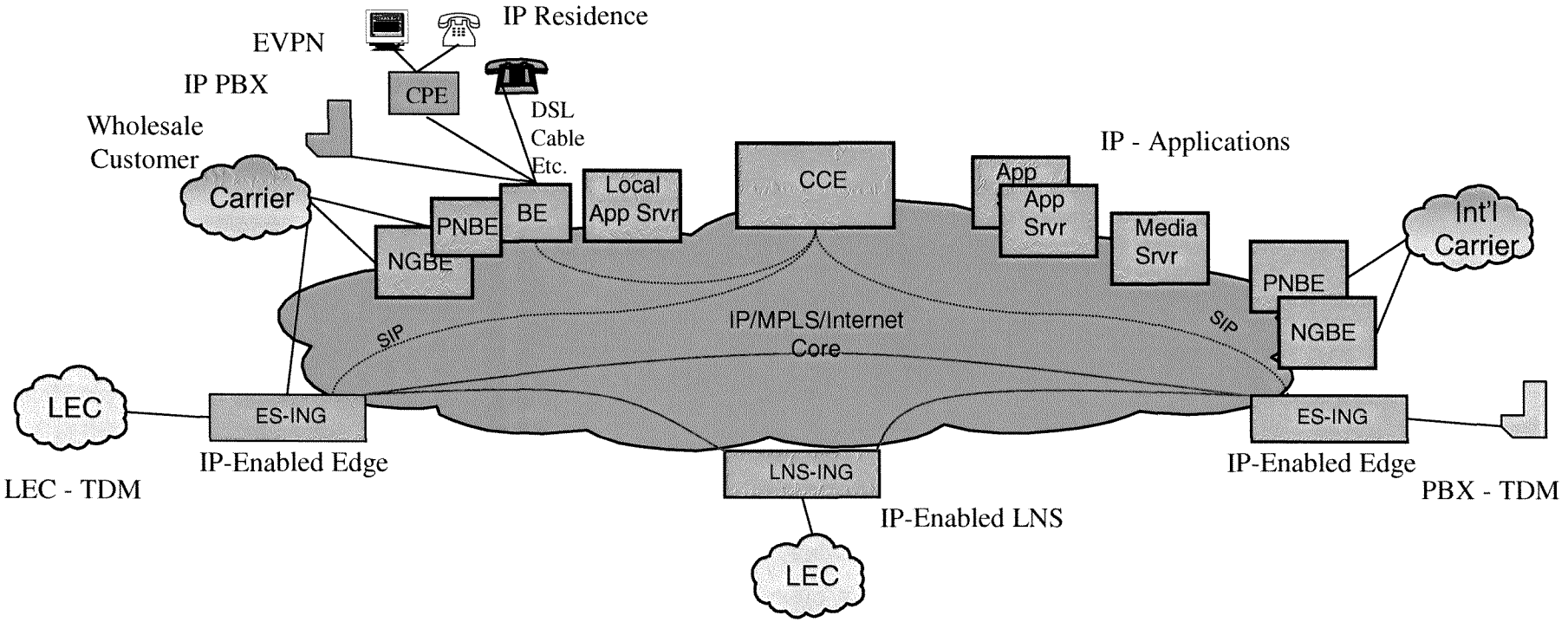


Advanced Voice Features Across TDM VoIP transport with hop-on/hop-off

Definitions

- BE – Border Element
- CCE – Call Control Element
- ING – Integrated Network Gateway
- NGBE – Network Gateway Border Element
- PNBE – Peer Network Border Element

VoIP – Today's Build-out



Interconnect local, toll & international switches with IP
Replace Adjuncts with Media Servers to reduce capex
Interconnect private VPNs with public VoIP services

- Definitions
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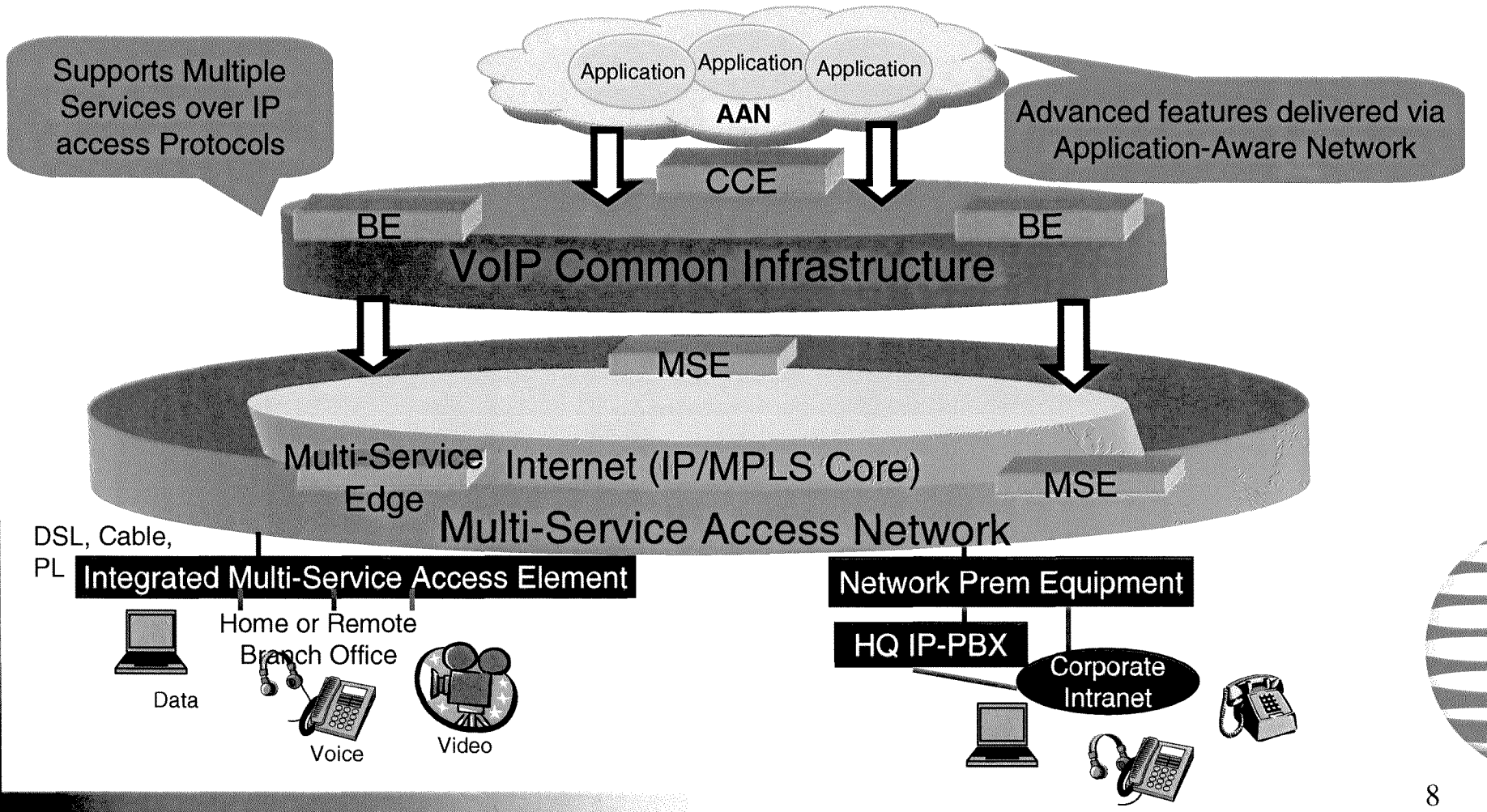
Voice Transformation to IP

- **The AT&T Voice Network – Big shoes to fill**
  - 350M calls/day
  - <100 Defects per Million
  - 10^{-5} blocking
  - 200 Toll switches; over 130 Local switches; 15 International gateways
- **Magnitude of Migration**
  - Approximately 525K T1s connected to the LD network
  - Even more complicated than the industry shift to all-fiber networks and the digital conversion (due to VoIP protocol explosion)
  - Huge investment in VoIP network, systems and migration tools
- **Industry perspective**
  - Little investment being made in circuit switching technology
  - Investment in VoIP technologies and real-time, IP-based applications
  - Intelligent endpoints (not just black telephones) are emerging

AT&T is undergoing a massive transformation to VoIP

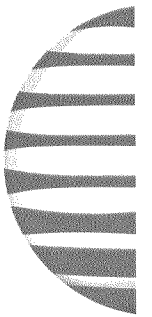
Services over IP – The Target

- Secure, integrated voice/data/video access
- Extension of premise intelligence to reduce operations cycle time
- Innovative applications in the network based on standard protocols and service creation environment
- End-to-end resiliency to central office failure



Take-Aways

- Data / voice distinction is already blurred and will become completely indistinguishable in the future.
- Voice is increasingly becoming an application over IP networks.
- Device functionality (computer/telephone) is converging.
- Because of the FCC's de-regulatory policies towards VoIP, capital was available to begin the enormous task of integrating VoIP technology into carrier networks.
- Today, innovation and investment in VoIP is on the rise as the industry moves to an integrated IP platform. AT&T, for example, is undergoing a massive transformation of the Voice Network to IP.
- The FCC should continue its deregulatory policies on VoIP to provide carriers the incentive to continue that evolution and to ensure continued investment growth throughout the industry



Top Ten Technology Trends

- IP Will Eat Everything!
- Broadband Will Be Common
- IP Will Ride Over Optics Directly
- Network Is Getting Smarter
- Data Will Move Into the Internet
- Home LANs Will Proliferate
- Security Is Critical
- Next-Gen Distributed Networking Is Growing
- Wireless Internet Will Be Big
- Application Development Will Be The Key